Goals: 1. To learn how to find approximate (least-squares) solutions for an inconsistent matrix problem $Ax = b$.
2. To be able to apply this knowledge to finding the least-squares best-fit line to data (like in Exercise 3.18).
3. To understand how the linear independence/dependence of columns in $A$ serves as an indicator of the kind of geometrical object the least-squares solutions form (i.e. a single point, a line, a plane, some higher-dimensional object, etc.).

Read: Section 3.2 of LAS

Terms to know:
- direct sum
- consistent (matrix equation)
- least-squares solutions
- residual
- normal equations

Questions you should be able to answer:

1. What feature of $A$ indicates whether there is just one least-squares solution to $Ax = b$ or more than one?
2. If $A$ is an $m$-by-$n$ matrix and you solve $Ax = b$ in the least-squares sense, is $x$ the closest element in $\mathbb{R}^m$ to $b$?
3. Suppose $A$ is $m$-by-$n$. What do we mean when we write $\mathbb{R}^m = \text{ran}(A) \oplus \text{null}(A^T)$?
4. Complete this sentence: If $\text{null}(A)$ is a 2-dimensional plane (subspace) in $\mathbb{R}^n$, then the solutions (or least-squares solutions, if the problem is inconsistent) of $Ax = b$ form a ___________ that is ___________ to $\text{null}(A)$.